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Growth with Inequality: Living Standards in Mexico, 1850–1950*

MORAMAY LÓPEZ-ALONSO

Abstract. This article focuses on trends in the adult heights of various sectors of Mexican society between 1850 and 1950 as a proxy for their biological and material standards of living. The evolution of biological standards of living is an alternative way to assess whether or not economic development after 1850 was beneficial to the population, using a proxy that relies on a basic natural characteristic, adult height. The recruitment records of the Mexican rural and federal militia provide us with information on the secular trends of heights of the Mexican labouring classes, while a database of passport applications allows us to compare the evolution of living standards across social classes. It is argued that the benefits of industrialisation and improved economic performance fostered by the Díaz regime (1876–1910) did not have a favourable impact on the biological wellbeing of the labouring population. There are, however, signs of improvement in living standards with the launching of welfare programmes at the end of the Cárdenas administration. In contrast, the average height of the elites increased throughout the period, suggesting that there was a growing disparity in the evolution of living standards between social classes.

Keywords: Mexico, Porfiriato, Mexican Revolution, biological standard of living, anthropometric history, economic history, welfare

Introduction

Over the past decades economic historians have told us much about the macroeconomic history of Mexico and Latin America throughout the nineteenth and twentieth centuries. There is a substantial literature on the emergence and evolution of the different industrial sectors, financial institutions and government agencies that regulated economic activity. However, we know very little about how the macroeconomic trends affected the welfare of common Mexicans and Latin Americans in general. This article provides such information by examining changes in the living standards of Mexico's

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labouring classes, in contrast to those of the elites, within the context of broader economic and political trends during the period from 1850 to 1950.

Moreover, the article presents a different methodology to analyse the evolution of living standards in Mexico in a long run perspective.¹ It considers new evidence on the biological standards of living of the Mexican population through the analysis of the evolution of adult stature during a hundred-year period. Although other methods of measuring living standards such as per capita GDP, real wage series, income distribution measures (for example, Gini coefficients and Lorenz curves), and demographic variables like life expectancy and rates of population growth are normally satisfactory, the data for these factors for the period 1850–1950 are either unreliable or scattered in Mexico. In contrast, a careful analysis using the methodology proposed by this article reveals new insights that provide a clearer picture about the evolution of standards of living.

In order to measure biological standards of living in Mexico this methodology uses a proxy that relies on a basic natural characteristic: adult height. Adult height is a product of the quality of health and nutrition during childhood years, the outcome of having a certain diet and living in a certain environment. Moreover, recent findings in human biology have shown that while genetic endowment is an important determinant of height at the individual level, in the aggregate genetic factors are less important. In addition, race is irrelevant at the genetic level in the determination of height. Thus, environmental factors are the main explanatory variables in adult stature.² These include food consumption, shelter, clothing and medical care. The measurements of stature are drawn from information found in the archives of Mexico's Ministry of Defence, the National Archives, and the Ministry of Foreign Relations.

The period between 1850 and 1950 is a highly relevant one for the study of the evolution of the biological standards of living. In this period Mexico underwent deep social, political and economic transformations, experiencing economic stagnation and war in the mid-nineteenth century, an export boom, the chaos of a revolution and its aftermath, the repercussions of a world-wide economic depression and, finally, the beginnings of sustained economic growth in the early 1940s. Moreover, this was the period when Mexico was transformed from a mainly agrarian society into an urban and more industrialised one.³ At the same time, the adoption of different

¹ The term 'biological standard of living' was first used by John Komlos in 'Stature and Nutrition in the Habsburg Monarchy: the Standard of Living and Economic Development', *American Historical Review*, vol. 90, no. 5 (1985), pp. 1149–61.

² Barry Bogin, *The Growth of Humanity* (New York, 2001), p. 244.

³ A recent article on twentieth-century Mexico comments: 'In the years after the revolution, modernization brought urbanization, industrialization, and a dramatic increase in the

technological innovations and advances in medical knowledge improved the quality of public health and enabled some Mexicans to live in healthier places. All these changes altered the demographic dynamics of the population. Mexico, of course, was not the only nation experiencing these transformations: the adoption of the same innovations in other countries was reflected in a substantial improvement in the biological standards of living of their populations.⁴ This article points to the scope of such improvements in the Mexican case.

One additional reason to study a hundred-year period concerns the historiography of Latin America in general. This study is an attempt to start filling out the lacunae of long-term studies in the literature. It is one of the first studies of this kind for a Latin American country, and it is the first to adopt a national level, long-term perspective for one of the most unequal nations in the world.⁵

The argument advanced here is that the Mexican labouring classes, who formed the great majority of the population between 1850 and 1950, suffered a decline in their biological standards of living beginning approximately in 1870. This decline was then followed by stagnation for most of the first half of the twentieth century. Upper and upper middle classes experienced a radically different path. This result is consistent with the argument that economic growth in an unequal society does not translate into an improvement in the physical welfare of the whole population.⁶

number of Mexicans who earned a living from wages and salaries. As a consequence wages became an important, sometimes explosive, issue in the country, particularly because the governments of the revolution promised a better life to wage earners'. Jeffrey Bortz and Marcos Aguila, 'Earning a Living: A History of Real Wage Studies in Twentieth Century Mexico', *Latin American Research Review*, vol. 41, no. 2 (2006), p. 115.

⁴ 'The remarkable improvements in physical well-being we have experienced over the course of this century were achieved mainly as a result of massive growth in government and regulation. Late in the nineteenth century, governments in Europe and North America began to translate medical and technical knowledge into efforts that made cities less deadly places to live'. John H. Coatsworth, 'Welfare', *American Historical Review*, vol. 101, no. 1 (1996), p. 9. For a thorough overview of the evolution of health and welfare in industrialised nations since the 1700s, see Richard H. Steckel and Roderick Floud (eds.), *Health and Welfare during Industrialization* (Chicago and London, 1997), chap. 11.

⁵ Ricardo Salvatore, 'Stature Decline and Recovery in a Food-Rich Export Economy: Argentina, 1900–1934', *Explorations in Economic History*, vol. 41, no. 3 (2004), pp. 233–55, and 'Stature, Nutrition, and Regional Convergence: The Argentine Northwest in the Twentieth Century', *Social Science History*, vol. 28, no. 2 (2004), pp. 297–324; Adolfo Meisel Roca & Margarita Vega, 'La estatura de la élite colombiana antes de la industrialización, 1870–1919' (Cartagena de Indias: Banco de la República, Cuadernos de Historia Económica y Empresarial #001498, 2005): available from <<http://ideas.repec.org/p/col/001037/001498.html>>.

⁶ 'Variations in the distribution of goods and services within societies explain how some productivity advances translate into rapid improvements in physical welfare, while others

Mexico experienced economic growth during some stages of this hundred-year period. The evidence presented here, however, suggests that the benefits of growth failed to reach most sectors of the population, and did not translate into an improvement in the material living conditions of the labouring classes. Moreover, the visible improvements that occurred were the by-product of the adoption of scientific innovations that led to transformations in public sanitation and public health. These transformations would have been adopted in Mexico with or without the 1910 revolution, as they were adopted in many other developing countries at the time.⁷

Living standards in the historiography of Mexico

Mexican historiography addresses the issue of living standards in a rather imprecise way. Although the new economic history of Mexico postulates that underdevelopment can be traced back to the early nineteenth century, there is a dearth of studies examining the evolution of living standards in the long run.⁸ Nor are there significant attempts to measure inequality prior to 1950.

There are a few exceptions to this void in the literature, such as the price series for foodstuffs created by the Colegio de México (COLMEX) group as well as works by John Coatsworth, Aurora Gómez-Galvarriato and Jeffrey Bortz. The COLMEX group undertook the first attempt to build data series on basic food prices and wages, and then inferred the living standards of the labouring classes by trying to estimate their purchasing power. Nonetheless, they did not take into account the fact that a substantial portion of the population operated outside the monetised economy.⁹ The works of Coatsworth, Gómez-Galvarriato and Bortz look at the evolution of living standards with a systematic analysis of wages and food price data. Their works concentrate on a specific region or a specific sector at some point in time.

make little or even accompany notable declines in living standards'. Coatsworth, 'Welfare', p. 6.

⁷ 'Whatever contribution the technological and scientific advances of the eighteenth and nineteenth centuries may have made ultimately to this breakthrough, escape from hunger and high mortality did not become a reality for most ordinary people until the twentieth century'. Robert W. Fogel, *The Escape from Hunger and Premature Death, 1700–2100: Europe, America, and the Third World* (Cambridge, 2004), p. 8.

⁸ See, for example, Stephen Haber's comment, 'The tremendous gap in per capita incomes between the major economies of Latin America and the economies of the North Atlantic is not a product of the twentieth century ... rather the income gap is the product of the eighteenth and nineteenth centuries': Stephen H. Haber (ed.), *How Latin America Fell Behind: Essays on the Economic Histories of Brazil and Mexico, 1800–1914* (Stanford, 1997), p. 1.

⁹ El Colegio de México, *Estadísticas históricas del Porfiriato: fuerza de trabajo y actividad por sectores* (Mexico City, 1961).

Coatsworth's essay, 'La producción de alimentos durante el Porfiriato', shows that food production for domestic consumption increased at the same rate as population growth. He thus rejects the traditional hypothesis that the development of agriculture oriented towards industrial development and the export sector was detrimental to agricultural production for domestic consumption. His findings suggest that Mexicans were not eating less in the aggregate.¹⁰ Coatsworth, however, does not venture to say anything about how this food production was distributed among the different strata of the population, leaving the effects of distribution as a subject for further study.¹¹

Bortz's work is on industrial wages in Mexico City from 1939 to 1975. The data series produced by the government for that time period resulted from different methodologies and changes in the definition of some of the industries. Bortz circumvents this problem by constructing a data series for the period using firm level-data. He finds that real wages in Mexican industry fell sharply after 1939, reached a low point in 1946, remained exceedingly low until 1952, and did not recover their 1939 levels until 1968.¹² Bortz's recent essay, with Marco Aguila, 'A History of Real Wage Studies in Twentieth-Century Mexico', concludes: 'It is not clear that any generation of Mexican industrial workers can experience sustained increase in the living standard – apart from the modernization of supply and demand for labour – under conditions of sustained underdevelopment.'¹³

Aurora Gómez-Galvarriato's (1998) work on the evolution of prices and wages from the Porfiriato (1876–1910) to the decade following the outbreak of the 1910 revolution also offers an interesting analysis on the living standards of industrial textile workers in Orizaba. She shows that real wages declined only towards the end of the Porfiriato, by 18 per cent between 1907 and 1910.¹⁴ However, she has also noted on the basis of other works that in certain respects, in contrast to agricultural workers, industrial workers were relatively privileged.¹⁵ A recent historiographical essay by

¹⁰ John H. Coatsworth, *Los orígenes del atraso: nueve ensayos de historia económica de México en los siglos XVIII y XIX* (Mexico City, 1990), p. 177.

¹¹ In the last footnote in his essay on food production, Coatsworth writes 'Si bien es cierto que la producción *per capita* de alimentos y bebidas creció durante el Porfiriato, hay que notar la posibilidad que hubiesen cambios en la distribución del ingreso ... No puede ser excluida sin embargo, la posibilidad de que la parte de la población con menores ingresos sufrió un descenso en su nicho de consumo de alimentos a pesar del aumento de la producción en promedio.' *Ibid.*

¹² Jeffrey Bortz, *Los salarios industriales en la Ciudad de México, 1939–1975* (México City, 1988), p. 270.

¹³ Bortz and Aguila, 'Earning a Living', p. 138.

¹⁴ Aurora Gómez-Galvarriato, 'The Evolution of Prices and Real Wages in Mexico from the Porfiriato to the Revolution', in John Coatsworth & Alan Taylor (eds.), *Latin America and the World Economy since 1800* (Cambridge & London, 1998), p. 351.

¹⁵ Mauricio Tenorio-Trillo and Aurora Gómez-Galvarriato, *El Porfiriato* (Mexico City, 2006), p. 82.

Gómez-Galvarriato and Mauricio Tenorio-Trillo, which reviews writing on the economic history of the Porfiriato, suggests that very little of this literature addresses the evolution of living standards across Mexico.¹⁶

Although the quality of data for the twentieth century is significantly better, our knowledge of living standards for the post-revolutionary period (1920s to 1940s) in Mexico is indirect. The historiography is very explicit in describing the investments that were made to modernise the country. One implicit assumption behind these accounts is that investments were made to improve the living standards of the population.¹⁷ But none of the studies is based on substantial, systematic evidence.¹⁸ Nowhere in the literature do we find compelling evidence on how exactly the standards of living improved after the revolution. Since the 1970s John Coatsworth has been concerned with the evolution of living standards in Latin America and, up to this day, he continues to highlight the importance of studying living standards in a long run perspective. Recently Coatsworth has mentioned the possibility of using trends in stature as a tool to measure the biological standards of living.¹⁹ Nevertheless, except for the work of Coatsworth, Bortz and Gómez-Galvarriato, there has been no attempt to measure living standards over a long period.

Mexican policy makers and intellectuals alike, however, have constantly mentioned the need to alleviate poverty and inequality. As early as 1947, the leading historian of the Colegio de México, Daniel Cosío Villegas, asserted that the revolutionary government had failed to diminish inequality, commenting: 'Instead of being distributed equally among the most numerous groups and those in greatest need of moving up the social scale, the new wealth was allowed to fall in the hands of a few who of course had no special merit of any kind.'²⁰ Some time later Fernando Rosenzweig, a well respected economic historian in Mexico, pointed out the polarised distribution of

¹⁶ *Ibid.*

¹⁷ See, for example, James Wilkie's comment: 'The Revolution's program of state directed integration of Mexican social and economic life has always been justified on the basis that it has given the poor classes a better standards of living', in James Wilkie, *The Mexican Revolution: Federal Expenditure and Social Change since 1910* (Berkeley & Los Angeles, 1967), p. 20.

¹⁸ Wilkie's calculation of a poverty index in Mexico for 1910–1960 is an example of an *ad hoc* interpretation. The index uses characteristics of poverty drawn from the population census such as illiteracy, being monolingual in an Indian language, living in a community with fewer than 2500 inhabitants, going barefoot, wearing sandals, regularly eating tortillas instead of wheat bread, and an absence of sewage disposal. They were given equal weight. Direct evidence on nutrition and health are absent from the index.

¹⁹ John Coatsworth, 'Structures, Endowments and Institutions in the Economic History of Latin America', *Latin American Research Review*, vol. 40, no. 3 (2005), p. 130.

²⁰ Daniel Cosío Villegas, 'Mexico's Crisis'. This essay was originally published in 1947, and is included in translation in Gilbert Joseph & Timothy Henderson (eds.), *The Mexico Reader* (Durham, 2002).

income as one of the problems of contemporary Mexico.²¹ He based his assertion on the data obtained in the first measurement of income distribution in 1957.²²

This study contributes towards filling these gaps by analysing the evolution of the biological standards of living of the Mexican labouring classes specifically by looking at the trends in heights of male recruits to the federal army and the militia, the *Rurales*. It uses data sources that cover eighty years. Moreover, it compares the findings drawn from the army and militia recruits with the heights of people from the upper classes who requested passports. The analysis of this data yields the conclusion that during the century between 1850 and 1950 Mexico's economic performance did not have a positive impact on the quality of life of its labouring classes for most of the period, and that there was a sharp contrast between them and the upper strata of the population. While the better off portion of the population drawn from the passport sample grew taller over time, for the military samples, composed of poorer people, there was a decline in average statures for cohorts born during the second half of the nineteenth century. There was stagnation in the stature of cohorts born during the first three decades of the twentieth century and a recovery for cohorts born in the 1940s. These results show that biological standards of living of people who were born and grew up after the 1870s deteriorated. Adult heights of males who were born and grew up during the Porfirian dictatorship did no better or worse than their counterparts who were born decades before. Finally, there is a significant improvement in the quality of life of cohorts born during the 1930s, which coincides with the launching of the social programmes of the late 1930s and the onset of the 'Mexican Miracle'. These findings suggest that notwithstanding the longstanding awareness that 'pauperism was the leprosy killing' the Mexican nation, the popular classes lived in material misery for most of the period under analysis.²³ The design and implementation of social policies hindered the spreading of benefits towards the majority of the population in a period when the economy did do better, thus perpetuating inequality.

Sources and methods

There are many ways to conceptualise and measure living standards. As noted already, the most common modern methods use material indicators

²¹ Fernando Rosenzweig, *El desarrollo económico de México* (Mexico City, 1989), p. 132.

²² 'Sabemos por datos relativos a 1957, que en extreme de la escala social, el 2.3% de las familias disfrutaban del 24% del ingreso personal disponible, y en el otro, al 46% de las familias les toca sólo el 14% del ingreso.' *Ibid.*

²³ The quotation comes from Andrés Molina Enríquez, *Los grandes problemas nacionales* (Mexico City, 1909).

such as per capita GDP, real wages, life expectancy (correlated to infant mortality and rates of population growth) and literacy. Given the quality of sources available, however, height by age data is the best alternative measure to study the evolution of living standards in Mexico during this time period.

Height and body mass

Height can be used as a proxy of wellbeing because the final height of an adult is the result of the interaction of several variables, which are all related to income. The reasoning behind this is as follows: If people during the first two decades of existence have good nutrition, adequate clothing, reasonable shelter and receive some schooling, they are more likely to grow taller than those people who, despite having the same genetic endowment, grow up under less favourable conditions. Not receiving one or several of these inputs places an individual at a disadvantage in developing to his or her optimum potential. Thus, in a given society, people from richer income strata would be taller than people from poorer income strata.²⁴ The quality of life during the first two decades of life is crucial because, according to medical research, by age 23 all humans reach maturity and their adult stature.²⁵

The advantages of height by age data

Richard Steckel, one of the leading researchers in the field of anthropometric history, has articulated five arguments to support using height by age data to measure living standards.²⁶ First, height data measure results instead of inputs, as would be the case of per capita income. Second, height data are

²⁴ There is a vast literature in the field of economic history and development economics that supports this argument. John Komlos and Richard Steckel have been the most prolific researchers on this topic over the past 25 years, and these are the assumptions behind anthropometric history generally.

²⁵ 'Growth, even of the skeleton, does not entirely cease at the end of the adolescent period. The limb bones stop increasing in length, but the vertebral column continues to grow until about age 30, by apposition of the bone to the tops and bottom of the vertebral bodies. Thus height increases by a small amount, on average 3 to 5 millimeters. From about 30 to 45 height remains stationary, and then it begins to decline. Head length and breadth and facial diameters increase slightly throughout life, and so do the widths of the bones in the leg and in the hand, in both sexes. For practical purposes, however, it is useful to have an age at which we may say that growth in stature virtually ceases, i.e. after which only 2% is added. At present in North America and north-west Europe the average boy stops growing, in this sense, at 17.5 years and the average girl at 15.5 years. There is a normal range of variation amongst individuals, amounting to about two years, on either side of these averages.' James M. Tanner, *Foetus into Man: Physical Growth from Conception to Maturity* (London, 1978), p. 18.

²⁶ Richard H. Steckel, 'Stature and the Standard of Living', *Journal of Economic Literature*, vol. 33, no. 4 (1995), pp. 1903–40.

suitable for measuring living standards in different societies. Very often the definition of poverty is full of implicit cultural assumptions that have explanatory force only in the industrialised nations. Third, height data leave open the possibility of studying societies with different patterns of development. Fourth, height data capture differences in income inequality. And fifth, heights are observable in all societies, which allows for a standard measure to make international comparisons.

The rate of increase in stature due to an improvement in living standards has changed over time. During the pre-industrial era when poverty, slow growth, poor health, widespread illiteracy and rural habitation prevailed in most countries, an increase of one or two centimetres in average heights over a century was a sign of improvement. However, since the mid-nineteenth century this process has accelerated throughout the industrialised world.²⁷ For instance, in a developed nation such as the Netherlands there has been an increase in the average stature of the population of 1.5 centimetres in each decade since the 1940s.²⁸ When analysing the case of each country, Steckel argues, one should take into account three equally important elements: first, the timing of industrialisation relative to the recognition of the germ theory of disease and public health principles; second, the extent of urbanisation, and third, diet.²⁹

Height data: the best alternative to study in the case of Mexico

Although the limitations of working with height data make it an imperfect measure of wellbeing, in the absence of reliable long term data series on income, wages and prices, as is the case for Mexico, it is still a good alternative. Using traditional indicators of wellbeing for Mexico presents several difficulties because, prior to 1940, the information available on per capita GDP, mortality, demographic data, real wages and prices is scattered and unreliable. Per capita GDP is a good measure of living standards because it proxies the income of the average inhabitant of a country. However, in countries in which income is unequally divided – Mexico being an obvious case in point – per capita GDP is a less useful measure. Using real wages is complicated too because of the quantity and quality of data available. It was not until the 1980s, when the Census Bureau of Mexico began to refine the methods of data gathering, that sufficient information was collected about the income and spending patterns of Mexican households. The raw data we have on income by occupation is even more problematic. There are very few

²⁷ ‘Throughout the industrialized world there has been a tendency during the last hundred years for children to become larger and reach maturity earlier’: Tanner, *Foetus into Man*, p. 1.

²⁸ Bogin, *The Growth of Humanity*, p. 231.

²⁹ Steckel, ‘Stature and the Standard of Living’, p. 1909.

records of wages for workers available, and those that exist only cover certain periods and certain regions of the country.³⁰ The data on workers' wages available for the period prior to the 1930s is for Mexico City and Orizaba (in the state of Veracruz).³¹ The information such data provides may be very useful for regional studies, but it is rather limited for the purpose of making generalisations about living standards at the macro-economic level over long periods of time.

For most of the nineteenth century, the demographic measures are not reliable because no real population censuses were done. Throughout most of the century there were two agencies that collected information on the population, the civil registry and the parish records. However, both of these institutional records had their limitations. The civil registry did not cover the whole nation, and even people who lived in places covered by the civil registry did not make use of it. Parish archives did not keep a complete record of the population either. Hence the data available from these sources is insufficient to be used as a proxy for patterns of demographic change during the nineteenth century. In addition, the first population census for which we have usable information was not done until 1895. The data series that can be drawn from these sources are thus insufficient for measuring the population's standards of living during the period 1850–1950.

The primary sources on which this study relies to determine the history of biological living standards in Mexico are the recruitment files for soldiers in the military archives of the Ministry of Defence (*Secretaría de la Defensa Nacional*, hereafter SDN), the recruitment files of the rural militia from the National Archives (*Archivo General de la Nación*, hereafter AGN) and the passport records from the Ministry of Foreign Affairs (*Secretaría de Relaciones Exteriores*, hereafter SRE). Both the military samples contain information on male soldiers such as height, occupation prior to recruitment, literacy, place of birth, age, place and date of recruitment. The passport sample, discussed further below, contains information on height, occupation, place of birth and age.

³⁰ Jeffrey Bortz and Marco Aguila provide an excellent survey on the calculation of industrial workers' wages from the nineteenth century to the present in which they state, 'Not surprisingly, at the beginning of the twentieth century, the Mexican government lacked the technical expertise to understand the wage problem. Nonetheless, post-revolutionary modernization brought improvements to the government's technical departments. Through the 1920s and 1930s there was a concerted effort to generate modern price indexes. Over time, the indexes improved and scholars and analysts increasingly used them to measure inflation and real wages. In 1938 the Dirección General de Estadística began to publish a systematic industrial wage survey, *Trabajo y Salarios Industriales*'. See Bortz and Aguila, 'Earning a Living', p. 136.

³¹ Gómez-Galvarriato, 'The Evolution of Prices', and Bortz, *Los salarios industriales en la ciudad de México*.

The records of federal military and the *rurales* militia recruits are the only sources from which one can draw a sufficiently large number of observations on statures to build a data series that would include generations of people (cohorts) born over a hundred-year period. Having obtained the raw data, it is necessary to calculate the year of birth of each recruit because we are interested in inferring what the quality of health and nutrition was of male recruits in their growing years, since final stature is an output of such variables, as previously noted. For instance, a soldier recruited in 1900 at age 24 implies that his year of birth was 1876 and his final stature was the result of the quality of health and nutrition from 1876 to 1899, which is the date when with full certainty he reached maturity.

There has been a debate amongst anthropometric historians on how to evaluate measurements of individuals who have not reached their final height. This age of maturity issue is particularly important for scholars using military records since the age of conscription for most military forces in the world was usually at ages 17 or 18, that is, five or six years younger than the age of maturity. A series of statistical tests have been developed to control for this potential source of bias and they are all applied to the samples in this study.³² In the case of Mexico the age of recruitment is not such a serious problem as elsewhere because the armies were formed by volunteers, meaning that recruits could enter at a wider range of ages. Still, it was often the case that recruits were younger than age 23, as indicated by Table 1. For military samples the minimum height requirement (hereafter HR) also introduces an unavoidable bias. Military samples naturally undercount people who are shorter than the HR; thus the samples are *upwardly biased* with respect to the total population. The statistical tests used to control for age and HR are discussed further later in this paper.

In order to show the extent of inequality and its persistence after the 1910 Revolution one can draw a comparison with the trends in heights of men who belonged to the elite and upper middle classes as evident from a sample of passport records. Unfortunately this sample does not cover the whole period of study, but it does cover a substantial portion of it, the years from 1860 to 1920, allowing one to confirm that there were differences in heights across social classes. The same adjustments for age were used in the passport sample as in the military samples.

³² 'One should analyze the height distributions of younger soldiers separately, because the time during which their growth could be influenced by environmental circumstances is not perfectly coincident with those of adults': John Komlos, 'How to (and How Not to) Analyze Deficient Height Samples: An Introduction', *Historical Methods*, vol. 37, no. 4 (2004), p. 163.

Table 1. *Sample Sizes*

Decade of birth	1840–49	1850–59	1860–69	1870–79	1880–89	1890–99	1900–09	1910–19	1920–29	1930–39	1940–49	Total
<i>Rurales</i> soldiers total	345	1232	2097	1432	1194	520						6820
<i>Rurales</i> (> 159 cm)	319	1169	1994	1358	1155	463						6458
<i>Rurales</i> (> 160 cm)	313	1147	1965	1338	1137	453						6353
<i>Rurales</i> (23 years & older)	341	1159	1631	1022	888	7						5048
<i>Federal</i> soldiers total				146	525	1687	2350	574	468	287	199	6236
<i>Federal</i> (> 159 cm)				131	445	1371	1957	510	364	223	175	5176
<i>Federal</i> (> 160 cm)				131	430	1311	1902	492	334	213	163	4976
<i>Federal</i> (23 years & older)				118	436	1271	1330	287	290	79	54	3865
Passport holders total			76	286	963	2231	4024	3353	457			11390
Passport holder upper classes			38	134	397	845	1180	523	5			5724
Passport holder upper classes (23 years & older)			38	134	397	844	1109	399	0			2921

Note: All soldiers and passport holders are 18 years and older.

Sources: see text.

The military data

The data on federal military recruits is drawn from the Archivo de Concentración. This contains the soldiers who are still alive (Sección de Personal Activo) as well as the Sección de Cancelados, which includes the files of deserters and dismissed personnel, and the Sección de Personal Extinto, which has the files of the deceased.³³

Men entering the military were: (a) between the ages of 18 and 45; (b) Mexican citizens; (c) at least 1.60 m tall; (d) did not have any chronic or contagious diseases, nor were handicapped, deaf or mentally deficient; (e) did not have any physical defect 'or monstrous or ridiculous appearance'; and (f) understood the Spanish language (*castellano*). However, these criteria were not strictly enforced. Height and health were the least enforced requirements, followed to a lesser extent by age and comprehension of Spanish. Age and place of birth were self-reported, because birth certificates were not widely issued in Mexico until the 1930s, and parishes did not issue copies of baptismal records. Heights were measured in metric units, rounded to the nearest centimetre, at the time of recruitment. Occupation before joining the army is used to infer the social class of the soldiers. Soldiers who were younger than age 18 or older than age 50 are excluded from the analysis.³⁴

The Rurales

The data for the rural militia are drawn from the Legajos de Gobernación in the 1821–1910 Public Administration section of the AGN. The sample covers all recruits between ages 23 and 50 who served in the rural militia for whom there is a recorded numeric stature.³⁵ This data set has 6,820 soldiers. The recruits of this corps came mainly from the Bajío (north-central Mexico), and to a lesser extent from central Mexico; very few of them came from the north. Half of them came from rural areas and the rest from small towns and cities. More than half the recruits were agricultural workers or mine workers, and a third were artisans. The average age of recruitment was 30 years old. Half of the recruits in the sample were illiterate. Since deserters could make some money from selling their equipment, desertion rates were

³³ The SDN does not allow researchers to consult any of the files of soldiers or retired soldiers who are still alive. This meant that this study had to stop with the cohort born in 1950.

³⁴ As noted above, these are the ages between which people maintain their adult height.

³⁵ In order to build this sample all the boxes that contained the recruitment files and muster rolls were reviewed. There were recruitment files in approximately 60 per cent of the boxes. Seventy per cent of the recruitment files corresponded to soldiers 23 years and older. Most of the recruits were born between 1860 and 1890.

high in spite of severe sanctions.³⁶ Tracking down deserters was so expensive that superiors preferred to recruit new soldiers to replace those who left the service. This explains the high number of recruitment records as compared to the relatively small size of the corps.³⁷

The passport sample

The passport records are available on microfilm in the Archivo de Pasaportes.³⁸ This series recorded all passports issued between 1910 and 1942; there are 22,500 observations, of which 16,612 include sufficient information for a regression analysis.³⁹ This information includes the physical stature of men and women 18 years and older, data and place of birth, as well as occupation. This article concentrates on men who belonged to the elite and upper middle class.⁴⁰ Literacy is universal in this sample. With this information we can infer the region of origin, the year of birth, and the social class of passport holders. People who requested passports who were not born in Mexico are excluded from the sample since presumably their growing years were not spent in the Mexico; thus they would not be indicative of living conditions in Mexico. Because the requesting of a passport does not impose HR, standard procedures can be applied to estimate trends and cross-sectional patterns by using ordinary least squares (hereafter OLS) linear regression analysis.

Some features of the samples

Sample sizes are reported in Table 1. The *Rurales* were born mainly during the third quarter of the nineteenth century while the federal military recruits were born mainly during the last quarter of the nineteenth century and the

³⁶ According to Paul Vanderwood, 'Captured deserters ended up with an army battalion in the hellholes of Veracruz and Yucatán but most who deserted were never captured or even pursued': Vanderwood, *Disorder and Progress: Bandits, Police and Mexican Development* (Lincoln & London, 1981), p. 109.

³⁷ Vanderwood states that by 1880 Porfirio Díaz had expanded the force by 90 per cent to 1,767 men: *Ibid.*, p. 70.

³⁸ The archive that holds passports at the SRE is part of the Dirección General de Pasaportes and it is not a public repository. It holds microfilmed records of all passports issued since 1910. In November 2002 this archive was closed to the public under the new transparency law that protects the privacy of Mexican citizens. After this date the archives can only be consulted with a judicial order.

³⁹ The observations that could not be used in the sample pertain to foreigners, passport holders younger than age 18 and older than 50, and files with information on height missing.

⁴⁰ The occupations for these classifications are: Skilled white collar: musician, typist, school teacher, book-keeper, federal employee. Elite: landowner, physician, lawyer, engineer. Students were assigned the social class according to their parents' occupation.

first decade of the twentieth century. The geographical classification was done dividing the country into four regions: the North, the Bajío (Centre/North), the Centre and the South.⁴¹ The recruits into the federal military, like those into the *Rurales*, came mainly from the Centre and the *Bajío* (Centre/North) regions. In the federal military men were mainly recruited between the ages of 18 and 30. The age of recruitment among *Rurales* tended to be higher than that of the federal military, between ages 23 and 50. For the federal military sample, it was possible to construct a series of heights of cohorts born between 1870 and 1950. The *Rurales* height series is for cohorts born between 1850 and 1899. Most of the draftees were lower class males, mainly unskilled workers.⁴² Both of these samples contain a very small number of observations of people who belonged to the better off classes; thus, this study concentrates mainly on the evolution of the standards of living of the labouring classes, defined as unskilled and skilled manual workers who lived both in rural and urban areas. The unskilled workers' category includes peasants, urban, miners, and construction workers. The skilled manual workers' category includes all those occupations that required learning a trade yet did not require literacy skills.⁴³

The military samples do not reflect a perfectly random selection of observations for three basic reasons. First, heights were not recorded in a strict way, so it was common to find recruitment files with no record of height. Second, many measurements were not useful for a statistical analysis. The earlier measurements were recorded in feet, inches and lines; and later they began to be recorded with the metric system.⁴⁴ The metric system was not officially adopted until 1884, and it was not until years later that its use became widespread, so it was not uncommon to find height described as small, medium and tall (*alto*, *mediano* and *bajo*). As a result, a high percentage of the files did not contain a height measurement, and hence were not

⁴¹ Regional Classification. North: Baja California Norte, Baja California, Sonora, Sinaloa, Coahuila, Chihuahua, Tamaulipas, Nuevo León. *Bajío*: Jalisco, Michoacán, Nayarit, Colima, San Luis Potosí, Durango, Zacatecas, Aguascalientes, Querétaro, Guanajuato. Centre: Distrito Federal, Estado de México, Morelos, Puebla, Veracruz, Tlaxcala, Hidalgo. South: Guerrero, Oaxaca, Chiapas, Tabasco, Campeche, Yucatán, Quintana Roo.

⁴² Socio-occupational categories. Unskilled workers: farm workers, farmers, peasants, labourer, industrial worker, miner, construction workers. Skilled manual workers: shoemaker, saddler, weaver, tailor, machine operator, blacksmith, carpenter, tanner, merchant, baker, chauffeur. I am aware that there could be significant wage differentials among *jornaleros*, peasants and miners depending on the region where they worked. However, there is no way to infer such differential with the information provided in the records.

⁴³ This occupational classification has been widely used by anthropometric historians. See Roderick Floud, Kenneth Wachter, and Annabel Gregory, *Height, Health and History: Nutritional Status in the United Kingdom, 1750–1980* (Cambridge, 1990).

⁴⁴ For these cases the measurements were converted to the metric system, using the Paris inch, also known as *pied du roi*, which equals 2.37 cm. This measure was used among all military forces under the Bourbon monarchy.

included in the sample. Only 60 per cent of the files reviewed had a height measurement and approximately 60 per cent of these had complete information on the rest of the variables.⁴⁵ Third, recruitment patterns regarding regions and the size of the army changed over the period of study for both samples due to political and financial circumstances.

One of the most common problems in military samples is shortfall, and erosion of height distribution caused by a height requirement, which could vary over time. After years of debating how to analyse such deficient samples, John Komlos, one of the founders of the field of anthropometric history, proposed a three-step analysis.⁴⁶ First, there is the visual inspection of sample histograms of the distributions of heights by date of recruitment, leaving the original units of measurement to ascertain the nature of the biases.⁴⁷ Second, there is the estimation of the direction of the trends of the means through the Komlos-Kim method (hereafter K&K).⁴⁸ Third, one does a regression analysis with a Truncated Ordinary Least Square Method (hereafter TOLS), or Truncated Regression (hereafter TR) 'that [is] able to explore the effect of covariates [such as age, time, birthplace, socioeconomic environment, mortality rate and population density] on heights, provided such data are available.'⁴⁹

Given that the shortfall created by HR can bias the results, it is hard to calculate the intensity of the bias since we do not know how lax the enforcement of HR was. Hence, to overcome this problem, I excluded recruits below 160 cm when conducting the height analysis both for the K&K test and the regression analysis. To make sure that there are no discrepancies due to rounding off practices when measuring recruits, I repeated the exercise excluding only recruits below 159 cm. The calculated trends will be upwardly biased but in a consistent way. Figure 1 shows the K&K tests for the federal and rural militias. We note that the direction of the trend does not change between raw samples and the truncated ones.

Race

With independence from Spain in 1821, slavery and the *castas* were abolished. Official documents therefore no longer required the description of the racial background of soldiers, so it is difficult to tell their racial composition. Some

⁴⁵ In the regression results it becomes evident that not all files have full information on all the variables we are taking into account.

⁴⁶ John Komlos 'How To.'

⁴⁷ Komlos, 'How To,' p. 161–2. Due to space limitations, the histograms of the military samples are not included in this article.

⁴⁸ John Komlos and J. H. Kim, 'Estimating Trends in Historical Heights', *Historical Methods*, vol. 23, no. 3 (1990), pp. 116–20, and Komlos, 'How to,' p. 165.

⁴⁹ Komlos, 'How To,' p. 165.

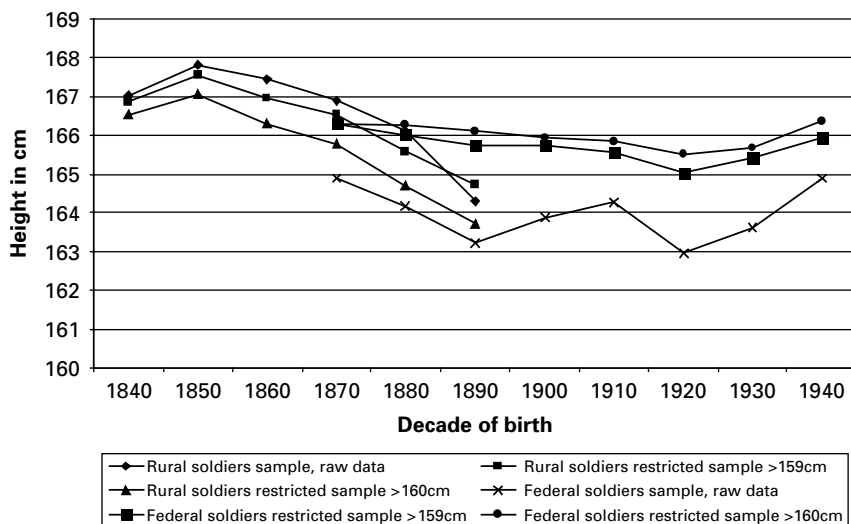


Fig. 1. Estimated trends of the height of Mexican adult soldiers: Komlos-Kim method is used for the restricted sample.

studies in social history argue that interracial mixing was so common throughout the colonial period that by the end to the eighteenth century racial differentiation in Mexico had come to mean little.⁵⁰

Rural–urban composition

Until the post-1920 period, approximately 90 per cent of the Mexican population lived in rural areas; it is assumed here, therefore, that most of the soldiers recruited who described themselves as coming from towns that had fewer than 15,000 inhabitants according to the 1895 census were actually rural in background.⁵¹

Trends in heights and compositional effects

Adult stature is determined by qualitative variables such as region of birth (north, *Bajío*, centre or south), decade of birth (1850s, 1860s, etc.) and social

⁵⁰ Cf. R. Douglas Cope, *The Limits of Racial Domination: Plebeian Society in Colonial Mexico City, 1600–1720* (Madison, 1993). Most of the files I worked with have pictures of the recruits, providing a rough idea of the ethnic origin of the soldiers. Not surprisingly, most appear to be *mestizo*. The recruitment requisite of understanding of the Spanish language would bias against the recruitment of indigenous males who were monolingual in their aboriginal language.

⁵¹ To establish a reference for classification I counted as urban those soldiers whose place of birth was a city that was listed as having more than 15,000 inhabitants in the figures provided by INEGI for the years 1878 and 1900, in Instituto Nacional de Estadística, Geografía e Informática, *Estadísticas históricas de México* (Mexico City, 1994).

class background (unskilled worker, skilled manual worker). To analyse the trends in heights and how the differences in qualitative characteristics influenced their evolution a regression was carried out for all samples. In the case of the military samples a truncated regression was used, and for the passport sample an ordinary least-squares regression.

The results are presented in Tables 2 and 3 and in Figure 2. The trend that we observe for the *Rurales* sample is one of gradual decline in the height of recruits. More precisely, the *Rurales* recruits born in the 1850s and 1860s were taller than those born in the 1870s and 1880s. The number of observations for the 1890s is too small to consider it significant. Altogether what the sample suggests is that the biological standards of living of soldiers who were born and grew up during the 1850s, 1860s and 1870s were better than those who were born and grew up during the last quarter of the nineteenth century. One can infer that there was more food for them. This finding is consistent with Richard Salvucci's finding that food production during the mid-nineteenth century was larger than in the early 1800s.⁵²

Moreover, because most recruits were from a rural background, the decline in heights for the cohorts who were born and grew up during the 1870s and 1880s supports the claim that the privatisation of communal lands as a result of the Lerdo Law and the Survey of Public Lands could have had a negative effect on the quantity of food available to children and adolescents from peasant families.

The analysis of the sample of federal soldiers provides data for the heights of the labouring classes after 1890. Here, the trend is stagnant for the decades that cover the period 1870–1900. The heights of recruits born during the 1870s were not significantly higher than those who were born in the early 1900s. Subsequently, there was a decline in heights for those soldiers who were born and grew up during the first decades of the twentieth century. The recovery in heights does not start until the 1930s, and only increases markedly for those born in the 1940s. It is necessary, however, to be cautious about the results for the 1940s since the number of observations for adults born in that decade is very small. Changes in the size of the armies over time as well as the recruitment by region are controlled for in the regression analysis.

The evolution of these trends suggests that the biological standard of living of the lower classes born and growing up during the Porfiriato did not improve. That the heights of soldiers who were born during the onset of industrialisation, which coincides with the Díaz era, stagnated instead of declining, as was the case in England and the United States, suggests that

⁵² Richard Salvucci, 'Mexican National Income, 1800–40', in Haber (ed.), *How Latin America Fell Behind*, p. 223.

something else was taking place that alleviated the biological standards of living of the labouring classes. This countervailing factor could have been the development and increase in the means of transportation in Mexico and the consequent integration of markets. On the other hand, there was a penalty for those who were born and grew up in the decade of the Revolution and the 1920s. There are two strong explanations for the significant decline in heights for those born in the 1910s and 1920s with respect to earlier decades. First, the food shortages during the years of the armed rebellion (1911–1917) and the subsequent uprisings had a toll on the nutrition and health of children and young people. The second explanation lies in the deleterious side effects of the early stages of industrialisation on the health status of the rapidly growing urban proletariat, also known in the literature on standards of living as the ‘urban penalty’. In spite of government efforts to clean up cities, public sanitation seldom reached soon enough the rapidly growing settlements where the majority of the urban proletariat lived.

There was no recovery in heights until the 1930s. The subsequent improvement in heights means that cohorts who grew up during the 1940s and 1950s enjoyed an improved quality of health and diet. This is consistent with the launching of larger scale initiatives to improve public health and the onset of the ‘Mexican Miracle’. Not only were the labouring classes recuperating their average height, but also infant mortality was reduced and hence life expectancy increased.

In Figure 2 one can see how the evolution in the stature of the labouring classes who joined the army compares with that of the elites who requested passports. Let us remember that the results of the soldiers are upwardly biased due to truncation below HR while the results of the passports are not. What is especially noteworthy is the growing disparity in heights during the period we are comparing. Passport holders from the upper classes (people born between 1840 and 1920) were consistently getting taller throughout the period covered in this sample. Most probably, their increase in height is not explained by an improvement in nutrition, but rather by an improvement in health which is consistent with the adoption of public sanitation initiatives.⁵³ The parts of the cities where these people lived were indeed becoming cleaner and these people could afford the best health care services available.

Regression results for all three samples also show regional differences. Regression coefficients in both samples show that males from the north and the Bajío were taller than their counterparts in the centre and south. The north-south height disparity is consistent with differences in the levels of economic performance, environmental conditions, and natural resource

⁵³ The results achieved by public sanitation during this time period were spectacular while there were no substantial changes in the dietary habits of the population.

Table 2. *Regression Model – Military Samples: Dependent Variable: Height (cm)*

Independent Variables	Federales Truncation Points				Rurales Truncation Points			
	159 cm (1a)	160 cm (1b)	159 cm (2a)	160 cm (2b)	159 cm (1a)	160 cm (1b)	159 cm (2a)	160 cm (2b)
Constant	167.6*	167.1*	168.0*	167.6*	170.5*	169.9*	168.4*	167.7*
Occupation								
Unskilled					−1.21	−1.24	−1.21	−0.57
Skilled manual workers	0.7**	0.7**	0.4	0.5				
Skilled white-collar workers	1.1	0.9	1.1	0.8				
Provenance								
North								
Bajío	−1.2*	−1.2*	−1.4*	−1.4*	−0.46	−0.5	−0.43	−0.47
Center	−3.5*	−3.4*	−3.3*	−3.5*	−1.20	−1.42	−1.19	−1.40
South	−4.1*	−4.1*	−3.8*	−3.6	−2.43	−0.29	−0.24	−2.91
Age								
18	−2.2*	−2.3*			−2.41	−2.47		
19	−2.1*	−2.4*			−1.21	−1.14		
20	−1.7*	−2.1*			−2.65	−2.74		
21	−0.9*	−0.8*			−2.12	−2.29		
22	−0.7**	−0.6			−1.67	−1.75		
Birth decade								
1840s								
1850s					1.11	1.52	1.12	1.53
1860s					0.56	0.81	0.57	0.82
1870s					0.07	0.24	0.07	0.24
1880s	−0.1	0.2	−0.2	0.0	−0.93	−0.96	−0.89	−0.93
1890s	−0.2	0.2	−0.4	0.0	−1.60	−1.71	−1.62	−1.70
1900s	0.0	0.2	0.0	0.2				
1910s	−0.3	0.0	−1.0	−0.7				
1920s	−0.9	−0.2	−1.0	−0.3				
1930s	1.2	1.8**	−0.7	−0.3				
1940s	1.2	2.1**	1.6	1.8				
Deserters	−0.4**	−0.4	−0.6**	−0.5				
χ^2					86.76	91.67	81.55	87.32
R ²	303.0	265.3	171.9	142.5				
N	5,176	4,976	3,309	3,194	6,129	6,027	4,495	4,412

Note: * significant at the 1 % level; ** significant at the 5 % level.

The regressions were estimated with STATA's trunc reg routine (trun reg).

Regressions (1) pertain to the whole population 18 years and older, regressions (2) pertain to adults only.

Federales: constants refer to adult illiterate, unskilled, non-deserter workers from Northern Mexico born between 1870 and 1879.

Rurales: constants refer to adult skilled manual workers from Northern Mexico born between 1840 and 1849.

Table 3. *Regression model for passport sample*

Independent Variables	Males (1)	Males (2)
Unskilled		
Skilled manual workers	0.93**	0.84**
Skilled white-collar workers	1.21**	1.06**
Elite	2.45*	2.33
North	2.82*	2.59*
Bajío	2.11*	2.04*
Center	1.37*	1.18*
South		
Age 18		
Age 19	−0.77	
Age 20	0.35	
Age 21	−0.15	
Age 22	0.47	
Age 23 or +	0.54	
Born 1860		
Born 1870	0.96	0.95
Born 1880	1.15	1.14
Born 1890	2.28**	2.27*
Born 1900	2.57**	2.58*
Born 1910	3.06*	3.02*
Born 1920	3.29*	(dropped)
Constant	164.83*	165.64*
R ²	0.0235	0.0229
N	11390	9693

* significant at 1 % level.

** significant at 5 % level.

Note: Method OLS, constants refer to adult unskilled workers, from the South of Mexico, born between 1860 and 1869.

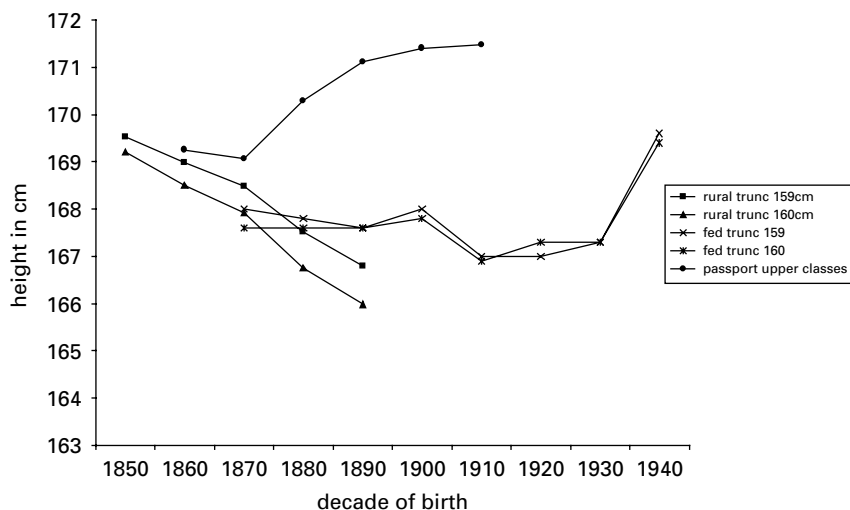
Regression (1) pertains to the whole sample, while regression (2) pertains to adults only.

endowments in the two regions that influence the quality of health and nutrition.⁵⁴ The diet in the north and the *Bajío* had more protein. These were regions where cattle production was an important activity, and the relative price of meat was lower than in the centre and south. In addition, people in the north lived in areas with lower population densities and had less exposure to epidemic diseases.⁵⁵

Soldiers who came from a background of having a trade were approximately a centimetre taller than those who were unskilled. This holds true for

⁵⁴ It should be pointed out that these results are not driven by a regional variation as a result of a relative increase in the number of recruits from the South. The number is low for both samples throughout the whole period of study.

⁵⁵ For a thorough discussion on the quality of health and diet across regions see Moramay López-Alonso, 'Height, Health, Nutrition and Wealth: A History of Living Standards in Mexico, 1870–1950,' unpubl. PhD diss., Stanford University (2000), chapter 6.

Fig. 2. *Regression results.*

both the military samples and suggests that having a trade, a form of human capital, correlates positively with nutrition and health. Parents who could afford to provide education and skills training for their children apparently could also afford a higher nutritional status for them or knew how to take better care of them. This is consistent with the experience of other countries. Moreover, during the period under consideration, the north of Mexico industrialised and experienced rapid and sustained economic growth, which may have provided added income for the population.⁵⁶

Conclusions

The evolution of the biological standards of living of the labouring classes, measured as the evolution of stature, does not follow trends in Mexico's overall economic performance while that of the elite and upper middle classes does. The trends in stature suggest that the living standards of the labouring classes gradually deteriorated from the 1870s. The lower strata of the population who were born during the 1850s and 1860s and grew up during the Reform and early stages of the Porfiriato (1850–1880) were better

⁵⁶ One of the reviewers of this paper questioned whether the decline in the average height of soldiers was due to the fact that more robust workers may have shunned military recruitment because they had better job opportunities in one of the several new industries begun during the Porfiriato. Given that the number of job openings in the new industries was too low with respect to the total labour supply of that time to represent competition to the military option, it is unlikely that this was the case.

off than their counterparts who were born during the last quarter of the nineteenth century and grew up under the later Porfiriato, as the cohorts born in 1850 were taller adults than the cohorts born in 1890. Living standards for labouring people then stagnated during the first part of the twentieth century until the 1930s. In terms of stature there was no significant change for cohorts born in the early part of the twentieth century until the 1930s. This means that the material living conditions, as inferred from this data on the labouring classes during this period, did not significantly improve or deteriorate for them. In other words, those who were born between the 1870s and 1900s did not undergo a positive or negative change in their biological standards of living; this is demonstrated by comparing the adult stature of the average labouring class male born in 1890 and a counterpart born in 1930. There is, however, an increase in heights of cohorts who were born after the end of the 1930s. Thus, the biological living standards of labouring classes who grew up during the 1940s and 1950s were significantly better than those of labourers growing up half a century before, but this mid-twentieth century standard of living represented little more than a recovery to that of the labouring classes who grew up nearly a century earlier.

This result is quite unusual for the first half of the twentieth century, inasmuch as heights increased considerably in almost all parts of the developed world at that time (Table 4). This evidence shows that industrialisation and the economic performance of the Mexican economy from approximately the third quarter of the nineteenth century did not have a positive impact on the Mexican labouring classes. It would not be surprising that these results were partly driven by endemic inequality; the contrasting trend of passport holders may substantiate this claim. Moreover, the Mexican pattern is rather reminiscent of the declining biological standard of living in Europe and North America at the onset of their modern economic growth in the first half of the nineteenth century.⁵⁷

These results suggest that, in a long-term perspective, the economic growth fostered during the Díaz regime and the social and political transformations that resulted from the 1910 Revolution did not substantially improve the biological standards of living of the Mexican labouring class. Moreover, the evolution of the living standards of the lower strata of the population is in sharp contrast with that of the upper classes. There was a trend of growing disparity between the two samples: the upper classes were becoming taller while the average stature of the labouring classes was declining or stagnating. By making use of tools borrowed from other disciplines, such as human biology, we can thus evaluate with a systematic

⁵⁷ Komlos, John, 'Shrinking in a Growing Economy? The Mystery of Physical Stature during the Industrial Revolution', *Journal of Economic History*, vol. 58, no. 3 (1998), pp. 779–802.

Table 4. *International comparisons*

year	Sweden	United States	France	Netherlands	Italy	Spain	Mexico
1800	167.0	172.9					
1830	167.9	173.5	164.1	166.5			
1840	167.6	172.2	164.3	165.3			
1850	168.2		164.5	164.2			167.8
1860	169.5		164.6	164.0		162.1	167.4
1870	170.2		165.1	164.8		161.7	166.9
1880	170.9		165.2	165.7	162.7	161.1	166.1
1890	172.3		165.3	166.8	163.1	160.8	164.3
1900	172.5		165.5	167.8	163.8	162.6	163.6
1910	172.9	172.1	166.0	168.7	164.1	163.5	165.1
1920	174.1	173.1	166.5	169.9	164.7	163.8	163.8
1930	175.2	173.4	166.0	171.9	166.0	164.7	164.2
1940	176.1	176.1	166.5	173.4	167.2	164.4	165.3
1950	177.9	177.1	168.8	174.1	167.4	164.4	166.0
1960	179.1	177.3	170.3	176.0	170.0	166.7	

Sources:

Sweden: Lars Sandberg and Richard Steckel, 'Was Industrialization Hazardous to your Health? Not in Sweden!', in Steckel and Floud (eds.), *Health and Welfare during Industrialization* (Chicago and London, 1997), p.129. (Recruitment years).

United States: Dora L. Costa and Richard Steckel, 'Long-term Trends in Health, Welfare, and Economic Growth in the United States, in Steckel and Floud (eds.), *Health and Welfare*, p. 172. (Birth cohorts).

France: Weir and Davir, 'Economic Welfare and Physical Well-Being in France, 1750–1990', in Steckel and Floud, *Health and Welfare*, p. 191. (Recruitment years).

Netherlands: J. W. Drukker and Vincent Tassenaar, 'Paradoxes of Modernization and Material Well-Being in the Netherlands during the Nineteenth Century', in Steckel and Floud (eds.), *Health and Welfare*, pp. 357–9. (Birth cohorts).

Italy: José Miguel Martínez Carrión, 'Estaturas, Desigualdad Regional y Desarrollo Económica en Italia y España durante el Siglo XX' *Mediterráneo e Historia Económica* (Cajamar, 2005).

Spain: José Miguel Martínez-Carrión, 'Estatura, salud y bienestar en las primeras etapas de crecimiento económico español. Una perspectiva comparada de los niveles de vida', Documento de Trabajo de la Asociación de Historia Económica No. 0102 (Murcia, 2001). (Recruitment years).

Mexico: see text.

analysis of quantitative evidence what the evolution of living standards was across social classes prior to the first measurement of a Gini coefficient in Mexico in the mid-twentieth century.

Observing the evolution of heights is an invitation to rethink the periodisation of Mexico's economic development from its post-independent era up until the mid-twentieth century, and to think about the evolution of inequality prior to the first measurement of income distribution in 1957. Statures declined for most of the second half of the nineteenth century, suggesting that a deterioration in the living standards of the labouring classes started well before the Porfiriato began; if anything, they stagnated during the Díaz dictatorship, and there is no clear improvement until the cohorts

born during the 1930s. This latter trend suggests that perhaps the reforms launched during the Cárdenas administration were the engine for an improvement in the biological standards of living of the Mexican labouring classes. In the meantime, between 1870 and 1920 the upper classes were growing taller.

The analysis of this data thus leads to a significant conclusion. With respect to the labouring class, economic growth in Mexico during the hundred years studied did not provide a healthy environment that was conducive to their physical growth while it did for the upper classes. This opens the door to begin tracing class disparities further back in time than the end of the nineteenth century while giving social and economic historians a tool to test their hypotheses on the history of poverty and inequality.